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FINAL REPORT

WILLMAN MINE RECLAMATION
BLAINE COUNTY, MONTANA

NOVEMBER, 1985

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FINAL REPORT

WILLMAN MINE RECLAMATION
BLAINE COUNTY, MONTANA

NOVEMBER, 1985

Attention: Mr. Richard Juntunen, Chief
Abandoned Mine Reclamation Bureau
Department of State Lands
1625 11th Avenue
Helena, Montana 59620

Prepared By: L. C. Hanson Company
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Bruce Brannon
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L. C. HANSON COMPANY
CONSULTING ENGINEERS & SURVEYORS
HELENA — GREAT FALLS — GLENDIVE

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WILLMAN MINE RECLAMATION

OBJECTIVE

The project goal was to backfill mine voids as a means to prevent future subsidence, backfill and recontour areas where subsidence had occurred, cleanup and reclaim various coal slack piles throughout the project area, and dispose of obstructions and debris left from previous mining activity.

PROJECT LOCATION

The project is located approximately 6 miles south and 4 miles east of the town of Chinook, Montana.

SITE DESCRIPTIONS

The WILLMAN MINE area topographic map covers about 20 acres in the NE 1/4, SW 1/4 of Section 27, T32N, R20E, Blaine County, Montana.

The maximum relief throughout the area reaches slightly over 50 feet from the hills and ridge tops to the bottoms of the drainages and depressions. Slopes reach somewhat more than 45 degrees, but frequently remain less than 40 degrees.

The area's elevation ranges from about 2800 feet (MSL) in the southwest to about 2660 feet (MSL) in the northeast.

Lonetree Coulee is the major physiographic feature which bisects the site running from the southwest to the northeast. The areas to the southeast of the coulee and also the area within the coulee itself are utilized for grazing. The areas to the northwest of the coulee are cultivated with the major crop being wheat. A series of local access roads cross the area. Two water impoundments (stock ponds) are located

along Lonetree Coulee. The largest pond is located in the upper end of the coulee on the southwest portion of the project area. The second pond is located approximately 500 feet northeast of the large pond.

MINE DESCRIPTION

Several small adits were driven into the northwest slopes of Lonetree Coulee. According to our historical records and information from conducting interviews with local individuals, these small adits did not extend more than 100 feet. Apparently local residents, who used the coal for heating their homes, would take coal from the mine until they were back 75 to 100 feet and then they would abandone the mine, move down the coulee a ways, and then start another one. This mining practice led to numerous adits, but the extent of the workings was very limited.

On the southeast slopes of Lonetree Coulee there appears to be two mines. Field reconnaissance and preliminary drilling revealed workings that extend for several hundred feet. Although these mines were more extensive than those found on the northwest side of the coulee, the amount of surface disturbance (i.e. subsidence, cracking) was very minimal.

All of the adits in the area were collapsed and plugged so visual inspection of the mines was not feasible. Mines on the northwest side of Lonetree Coulee were partially collapsed with several subsidence features lending evidence to this. Drilling during the planning phase showed varying degrees of collapse throughout the mined areas. Some of the boreholes showed intact mine workings while others had over 20 feet of loose material which suggested that peaking was occurring.

PROJECT PLANNING

Several reclamation methods were compared using cost, site location, land use, and extent of reclamation for decision making criteria. A

combination of several reclamation methods were proposed and accepted for work at this site.

On the undermined grazing land, surface reclamation only was performed (i.e. subsidence backfilling, shaft filling, coal slack removal and disposal, adit closures). Total reclamation (i.e. backfilling of underground workings) of the grazing land was too costly for this type of land use.

On the cultivated areas, safety of the personnel farming the land was of priority concern. Therefore, total reclamation of the cultivated areas was the goal. In one area a very hazardous subsidence had occurred. Preliminary drilling, resistivity surveys, and field reconnaissance revealed an approximate one acre area that was undermined. Overburden thicknesses of 20 feet over this area made remote backfilling of the underground workings via boreholes the most economical alternative when compared to excavation and backfilling of the workings. In another cultivated area the overburden thickness was only a maximum of 10 feet. In this area, excavation of the workings was determined as the most economical alternative.

All disturbed areas on site were planned for seeding, fertilizing, and mulching, and the larger areas were to be fenced.

WORK DESCRIPTION

The project work included: backfilling surface subsidence pits; drilling boreholes for locating mine voids and stowing fill material into mine voids; plugging boreholes; water injection; debris cleanup; coal slack cleanup and disposal; excavation and backfilling of mine workings; structure removal and disposal; shaft filling; adit closure; construction of farm fence; and the seeding, fertilizing, and mulching of all disturbed areas.

A pre-construction meeting was held on Monday, April 15, 1985 at the

WILLMAN MINE site with Gene Shumaker, Joe Aline, and Ken Carlstad of Shumaker Trucking (Contractor); Lowell Hanson, Wally Benjamin, and Bruce Brannon of L. C. Hanson Company; and Jeff Hagener of the Department of State Lands in attendance. The Contractor's construction schedule and items of work were discussed. The Contractor was also given a Notice to Proceed dated Tuesday, April 16, 1985. The Contract called for pneumatic stowing of the mine voids. The Contractor elected to use gravity flush stowing instead. This change was discussed at the pre-construction meeting and the Contractor was given approval to use this method.

Work was started on April 16, 1985. The first two days were spent performing surface reclamation which included subsidence backfilling, shaft filling, debris cleanup, structure demolition, adit closure, and coal slack cleanup.

On Thursday, April 18 drilling was started in Reclamation Area No. 1 to locate mine workings for gravity flush stowing and water injection. They also started exploratory excavation in Reclamation Area No. 2 to locate mine workings for excavation and backfilling. Trenches were dug three feet into the four foot thick coal seam and no workings were found so excavation and backfilling of the workings was not necessary on the project.

On Friday, April 19 drilling continued and water injection was started in Reclamation Area No. 1. T.V. monitoring was done on mine voids encountered but the results were poor at best. This was due to the condition of the mine voids. The voids found were only one to two feet high and the continuity between voids was very limited. The water injection was done to consolidate loose material in mine voids.

Gravity flush stowing was started on Monday, April 22. Water injection was continued throughout the day. Water injection in the boreholes was not giving very satisfactory results so they moved the injection pipe to a snake hole above the old collapsed adit. After injecting

approximately 7000 gallons of water a substantial collapse opened up a large cavern which was later filled with material by gravity flushing.

All gravity flush stowing and water injection was completed on Tuesday, April 23 along with all of the surface reclamation. The fencing crew arrived on site and commenced with their work.

On Wednesday, April 24 the seeding sub-contractor, Prairie Hydroseeding fo Havre, MT (Bob Keeler - Owner), arrived on site and started their operations. Mr. Keeler refused to follow the specifications and disregarded comments made by the Owner's representative, Bruce Brannon. When Dick Juntunen and Jeff Hagener of the Department of State Lands were informed of this, the said that if the site did not revegetate to the satisfaction of their department, the Contractor would be required to return in the Spring of 1986 and reseed all unacceptable areas. Rains halted the seeding operations until the following week but the fencing crews continued erecting fence.

Seeding operations started again on Monday, April 29 and all seeding was completed the following day. Borehole plugging also started on April 29 and was completed in two days.

The fencing crews finished on Thursday, May 2, completing the WILLMAN MINE project.

QUANTITY SUMMARY

Area Reclaimed	5 Acres
Drilling Boreholes	857.5 L.F.
Fill Abandoned Boreholes	54 Each
Water Flooding (Injection)	107 MGAL
Subsidence Backfill	160 C.Y.
Exploratory Trenching	70 L.F.
Surface Reclamation	$6,000.00
Providing Backfill Material	152 Tons

Stowing Backfill Material	120 Tons
Type "F-3" Farm Fence	244 Rods
Seeding, Fertilizing, & Mulching	0.75 Acres
TOTAL CONSTRUCTION COST	$ 40,462.04
Cost Per Acre	$ 8,092.41

NOTE: Detailed unit costs and complete quantity breakdowns by area are available in the project records

COMMENTS

The project only required 18 calendar days (14 working days) to complete. This rapid completion can be credited to the Contractor for having a sufficient work force and the proper equipment on site and ready to go to work at the required time.

In Reclamation Areas No. 1 and No. 2 the mine workings were not nearly as extensive as originally anticipated. The volume of material stowed into the mine workings in Area No. 1 was less than half of what was estimated. The mine workings in Reclamation Area No. 2 were planned for total excavation and backfilling but exploratory trenching in this area revealed no mine workings. Apparently when they mined this area they would only mine in 30 or 40 feet and then move over and start another mine. The fact that the work required in Reclamation Areas No. 1 and No. 2 was substantially less than anticipated also cntributed to the short project completion time.

The problems that occurred with the revegetation work can be attributed to the uncooperative attitude of the seeding sub-contractor, Bob Keeler. This was an unfortunate situation because the Contractor, Shumaker Trucking, was held responsible for Mr. Keeler's inferior work even though the Contractor did a good job on the remaining work. Jeff Hagener checked the revegetation progress at the site in September and said that it looked fair. He wanted to check it again in the Spring of

1986, and if it does not meet with his approval the Contractor will be required to re-seed the poor.

Overall the project went very well and the end product met with approval of both the Department of State Lands and L. C. Hanson Company personnel.

Respectfully Submitted,

Walter J. Benjamin

Walter J. Benjamin, E.I.T.

SLIDE DESCRIPTIONS

WILLMAN MINE

1.	4-17-85	Cleanup of debris around Adit No. 1 in Area 5. Coal slack lies under boards and metal.
2.	4-17-85	Debris from Adit No. 1 in Area 5 was hauled out of coulee to the disposal pit where it was burned with the old building foundation. Old bed springs are hanging out of loader bucket here.
3.	4-17-85	Adit No. 1 in Area 5 after debris removed. This was later covered with topsoil.
4.	4-17-85	Adit No. 2 in Area 5 was filled with coal slack from spoil pile across coulee. In this slide it has been covered with cover material and topsoil.
5.	4-17-85	Adit No. 1 in Area 5 before it was covered with cover material and topsoil. No work was done to subsidence further up hill.
6.	4-17-85	Borrow Area No. 4 in Area 5. Cover material and topsoil obtained here.
7.	4-17-85	Cistern in Area 5. The top has been demolished and disposed of in cistern.
8.	4-17-85	Looking into the cistern that was shown in Slide 7. This was later filled with field rock and covered with topsoil.
9.	4-17-85	The small subsidence hole in Area 5 has been filled and is being covered with topsoil.
10.	4-17-85	Air shaft in Area 5. Old cable was disposed of in shaft. Cable was pushed down with the backhoe and then shaft was filled with field rock and topsoiled.
11.	4-17-85	Looking up coulee at Area 4. Coal Slack Pile No. 1 is on the right hand side of the coulee. It was partially disposed of in the hole at the center of the slide. It was then covered with cover material and topsoil from Borrow Area No. 2 which is at the left bend of the coulee.
12.	4-17-85	Borrow Area No. 4 in Area 5. Some good topsoil was salvaged and stockpiled at the top to recover this area after excavation was completed.
13.	4-17-85	Disposal pit in Area 5. Old building was pushed in here and burned. Topsoil again stockpiled separately to recover the area.

14.	4-17-85	Coal Slack Pile No. 1 in Area 5. It has had 18" cover material placed and has been partially topsoiled. More topsoil was placed on top and the edges.
15.	4-17-85	Building ruins have been pushed into the disposal pit and it is ready to burn. This is the same area as shown in Slide 13. This slide better shows topsoil piled separately.
16.	4-17-85	Adit No. 1 in Area 5 after cover material placed and topsoil spread.
17.	4-17-85	This is one of the seven subsidence pits at the top of Area 4. No work has been done yet.
18.	4-17-85	Stripping topsoil from one of the subsidence pits shown in Slide 17. Enough topsoil was stripped from each pit to cover it after it was filled.
19.	4-17-85	Coal Slack Pile No. 2 in Area 4 prior to construction.
20.	4-17-85	Borrow Area No. 2 in Area 4, looking down coulee. Starting to run out of good material so pit was expanded as can be seen by the closest stakes.
21.	4-17-85	Borrow Area No. 2 in Area 4, same as Slide 20. Many large rocks were coming out of the uphill bank as can be seen here.
22.	4-17-85	Burning the old building in the disposal pit in Area 5. This same pit was shown in slides 13 and 15. After fire burned out it was covered, topsoiled, and seeded.
23.	4-18-85	State helicopter taking off in Area 1. Tool van, L. C. Hanson Company airplane, and equipment parked in background.
24.	4-18-85	Hi-Line Drilling of Havre, MT was subcontracted to do the exploratory drilling. T.V. equipment shown in foreground.
25.	4-18-85	Exploratory trenching in Area 2. Case 580 C Backhoe used to dig to a depth of 3' into coal. No mine workings were encountered.
26.	4-18-85	Exploratory trenching on top in Area 2. The adits were also dug out to salvage topsoil and explore mine workings. The adits were recontoured to match the existing topography.
27.	4-18-85	Looking into exploratory trench in Area 2. These were dug approximately 14' deep and no mine workings were encountered.
28.	4-18-85	Exploratory trenching in Area 2.

29.	4-18-85	Adits in Area 2 dug out to salvage topsoil and locate mine workings. No workings were found.
30.	4-18-85	Drilling in Area 1. Plywood covers were used to protect the boreholes until utilization.
31.	4-18-85	Exploratory trenching in Area 2.
32.	4-18-85	Two of the three coal slack piles in Area 3. These were covered and topsoiled. This is prior to construction.
33.	4-18-85	Coal Slack Pile No. 2 in Area 4. This is the same as Slide 19 but looking down the coulee. The existing fence was temporarily taken down in the bottom of the coulee.
34.	4-18-85	The third coal slack pile in Area 3. Same area as shown in Slide 32. Taken prior to construction.
35.	4-18-85	Top of Area 4. Borrow Area No. 3 and the seven filled subsidence holes in this area.
36.	4-19-85	Pumping water for water injection. Also can see water seeping out of ground caused by water injection in Area 1. The coal slack has been covered with cover material and topsoil.
37.	4-19-85	Same as Slide 36.
38.	4-19-85	This was taken from Area 1 looking at Area 2. Borrow Area No. 1 is in the center of the slide. The two adits were on the hillside and exploratory trenching was done where the piles are. The borrow area has been reclaimed and adit work is completed. Fencing and seeding are still required.
39.	4-19-85	A water tank was set in the back of the dump truck and filled with water to check the accuracy of the flow meter. Drill rig is also shown.
40.	4-22-85	Gravity flush stowing hopper is set up over a borehole with water hose connected to it. The loader dumps into the hopper and material is flushed into mine voids.
41.	4-22-85	Stowing material as supplied to site. It is a sandy gravel with few plastics.
42.	4-22-85	Flow meter in water line.
43.	4-23-85	Water seeping out of hillside in Area 1 after water injection. The surface dried out by the time the project was complete.
44.	4-23-85	Setting up the water pump in Area 1.

45.	4-22-85	New subsidence hole that opened up in Area 1. It was approximately 2' in diameter at the surface but was about 20' deep and 12' in diameter at the bottom. Water injection opened it up. Rattlesnakes were coming out of it.
46.	4-23-85	The same hole as shown in Slide 45 but it has been dug out to accommodate stowing through this hole.
47.	4-23-85	Stowing into the subsidence hole that was shown in Slides 45 and 46. The stowing material was stockpiled near the hole and slowly dropped in with the hoe bucket. The water hose was also stuck in the hole but it is not visible here.
48.	4-23-85	Same operation as shown in Slide 47. Now water hose is visable.
49.	4-23-85	This is the flow meter which was at the end of the hose while stowing into the subsidence hole as shown in Slides 47 and 48.
50.	4-24-85	The small Ford tractor was used to drill post holes for fence. The loader is scarifying torn up areas in preparation for seeding. Fertilizer was applied before scarifying on all upland seed areas.
51.	4-29-85	Pouring concrete into the new boreholes in Area 1. The concrete plugs came to within two feet of the surface. Topsoil was used as fill for remaining two feet.
52.	4-29-85	Pouring concrete plugs into an existing borehole in Area 3.
53.	4-24-85	Finn Hydroseeding truck filling up with water.
54.	5-2-85	This is the top of Area 5 after surface reclamation and seeding has been done. The old cistern is closest, the subsidence is on the left, and the old building foundation in the back. No fencing was done here because this ground may be cultivated next fall.
55.	5-2-85	This shows the top of Area 4 where the seven subsidences and borrow area were. Seeding and fencing completed.
56.	5-2-85	Area 5 - Adit No. 1 is closest and Borrow Area No. 4 is across the coulee. Seeding and fencing completed.
57.	5-2-85	Area 5 - Adit No. 2 is closest and Coal Slack Pile No. 1 is across the coulee. Seeding and fencing completed.
58.	5-2-85	Coal Slack Pile No. 1 in Area 4 after seeding and fencing completed.

59.	5-2-85	The same area as shown in Slide 58 is at the center of this slide. Borrow Area No. 2 is further up the coulee on the left. Part of the area where the seven subsidence pits were filled in Area 4 is visible at the top right. Seeding and fencing completed.
60.	5-2-85	Borrow Area No. 2 in Area 4 is at the center of this slide. Coal Slack Pile No. 2 in Area 4 is up the coulee on the right. The three small piles in Area 3 are also visible. Seeding and fencing completed at all of these sites. The haul road leading to Coal Slack Pile No. 1 in Area 4, which is at the right center of this slide, was also seeded.
61.	5-2-85	This is the top of Area 4 where the seven subsidence pits and Borrow Area No. 3 were. Seeding and fencing completed.
62.	5-2-85	This shows the top of Area 1 where the drilling and stowing occurred. It has been cleaned up but no seeding or fencing was required.
63.	5-2-85	This shows the adits and Borrow Area No. 1 in Area 2. The borrow area was seeded with the coulee mix and the adits with the upland mix. One fence enclosed this entire area.
64.	5-2-85	This shows a double panel as completed in Area 2.
65.	5-2-85	This shows where the exploratory trenching was done in Area 2. Seeding and fencing completed.
66.	5-2-85	This shows Borrow Area No. 3 in Area 4 after seeding and fencing completed.
67.	5-2-85	This shows some of the seven subsidence pits that were filled at the top of Area 4. Seeding and fencing completed.
68.	5-2-85	Caution sign in Area 4.
69.	5-2-85	An exploratory borehole after it was plugged with concrete to within two feet of surface. The old cuttings were cleaned up and topsoil spread over it.
70.	5-2-85	Coal slack pile in Area 1 after seeding and fencing completed.
71.	5-2-85	This is at the top of Area 1 where the second subsidence occurred. The coal slack pile as shown in Slide 70 is down the hill and to the right of the area shown in this slide. Area 2 is in the background.
72.	5-2-85	This is the field in Area 1 where the drilling and stowing was done. The area has been cleaned up. Seeding or fencing was not required.

73.	5-2-85	The end of Borrow Area No. 2 is in the foreground. Coal Slack Pile No. 2 in Area 4 is on the right and the three piles in Area 3 are further up the coulee. Seeding and fencing completed.